

**Evaluation of Predatory Mites and a  
Reduced-Risk Miticide for Control of  
Twospotted Spider Mites in North-Central  
Florida**

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# Strawberry Production in Florida

- Ranks 2<sup>nd</sup> behind CA
- Produces 100% of the domestically grown winter strawberries
- 7,000 acres
- \$190 million value
- Twospotted spider mite is the major arthropod pest



# Twospotted Spider Mite (TSSM)



- *Tetranychus urticae* Koch
- Life cycle takes ~19 days and females can lay up to 100 eggs





# Cultural Control of TSSM

- Plant mite-free transplants
- Sanitation
  - Plant residue can harbor TSSM populations



# Chemical Control of TSSM



- Miticides
  - Agri-Mek® (Abamectin)
  - Savey® (Hexythiazox)
  - **Acramite 50WP® (Bifenazate)**
  - Brigade® (Bifenthrin)
  - Vendex® (Fenbutatin-oxide)





# Biological Control of TSSM



- Predatory mites

- *Phytoseiulus persimilis*  
Athias-Henriot



- *Neoseiulus californicus*  
McGregor



# Previous Research



- *P. persimilis* is used effectively to control TSSM in 30% - 40% of strawberry fields in South-central Florida. (Decou, 1994 and van de Vrie and Price, 1994)
- *P. persimilis* does not adequately control TSSM in more northern areas of the state, possibly because of the colder temperatures. (White and Liburd, 2003)
- *N. californicus* is known to effectively control TSSM in strawberry fields in California. (Oatman et al. 1977a; Oatman et al. 1977b; and others)
- There are many papers on the effectiveness of both species in other parts of the world, mostly studies of *P. persimilis*.

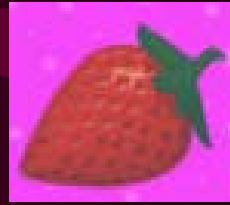


# Objectives

- To conduct controlled laboratory experiments comparing the effectiveness of the predatory mites *P. persimilis* and *N. californicus* for control of TSSM.
- To determine if *N. californicus* can provide effective control of TSSM in north Florida strawberry fields
- To compare predatory mites with a reduced-risk miticide (Acramite 50WP®) to determine their efficacy on twospotted spider mite control.



# Methods (Laboratory)



- Colony
  - A TSSM colony reared on strawberries was maintained in the laboratory to ensure that only TSSM predisposed to strawberries were used in the experiments.
- Experimental Protocol
  - Fifteen mite-free strawberry plants var. “Festival” were placed into previously constructed mite-free cages.
  - Ten TSSM were released onto each plant and allowed to multiply for 2 weeks.
  - After two weeks, 1 leaflet from each plant was collected. The number of TSSM motiles and eggs on each leaflet were counted.



# Methods (Laboratory)



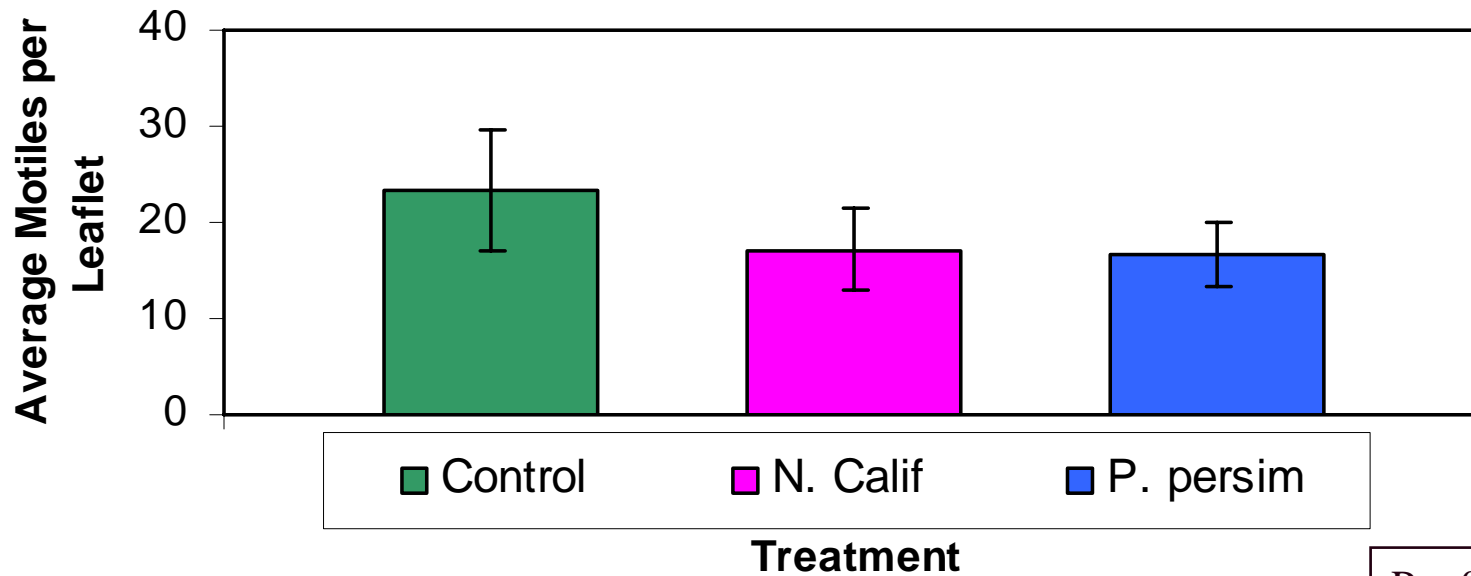
- Predatory mites were released onto each plant 3 days after the initial sample was taken
- Setup:
  - Five replicates of three treatments:
    - Untreated (control) plants
    - 10 *P. persimilis* per plant
    - 10 *N. californicus* per plant
- TSSM and predatory mite populations were sampled once a week for 5 weeks.





# Laboratory Results (Motiles)

Average Motiles per Treatment

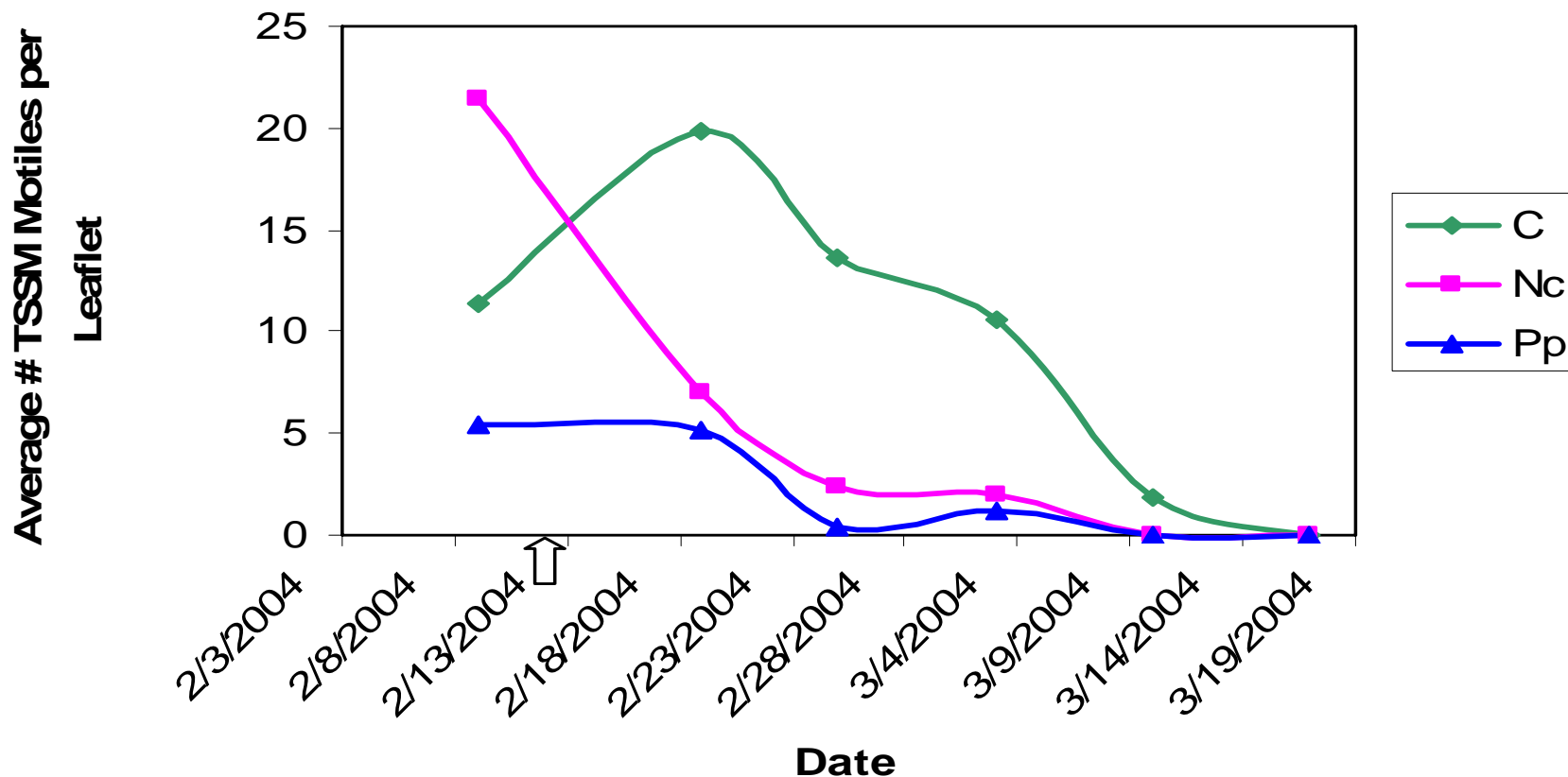


P = 0.6185



# Laboratory Results (Motiles)

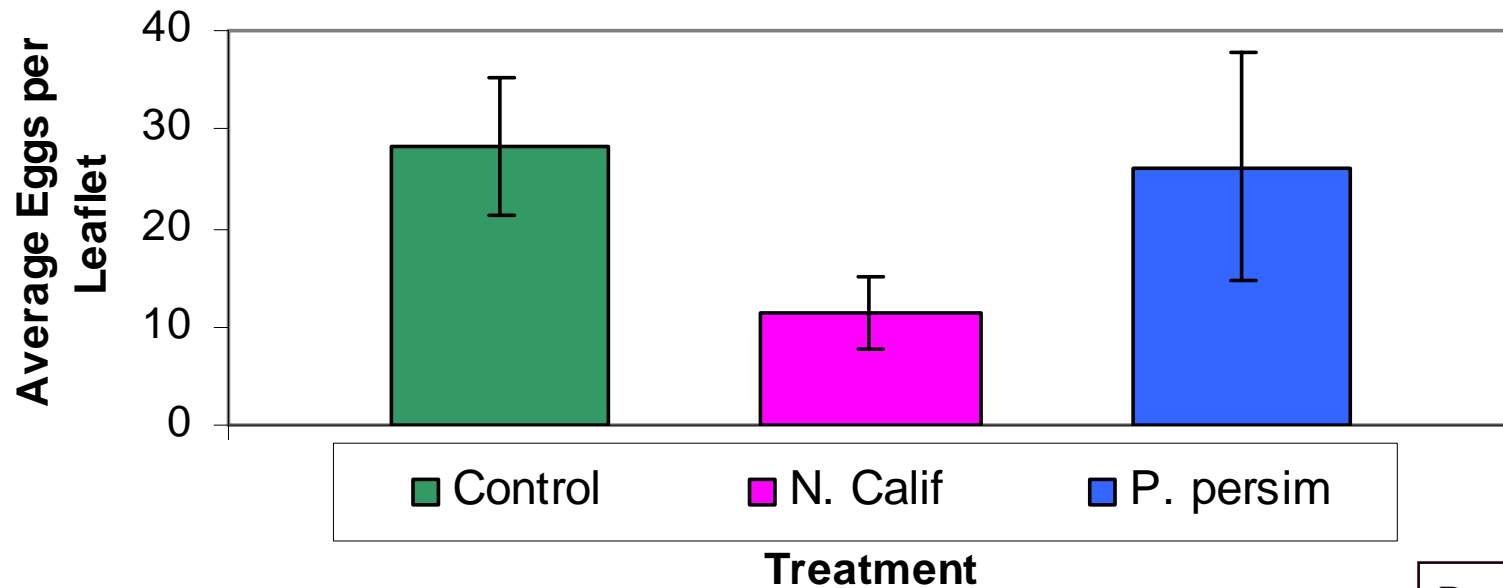
Average TSSM Motiles per Treatment per Week





# Laboratory Results (Eggs)

Average Eggs per Treatment



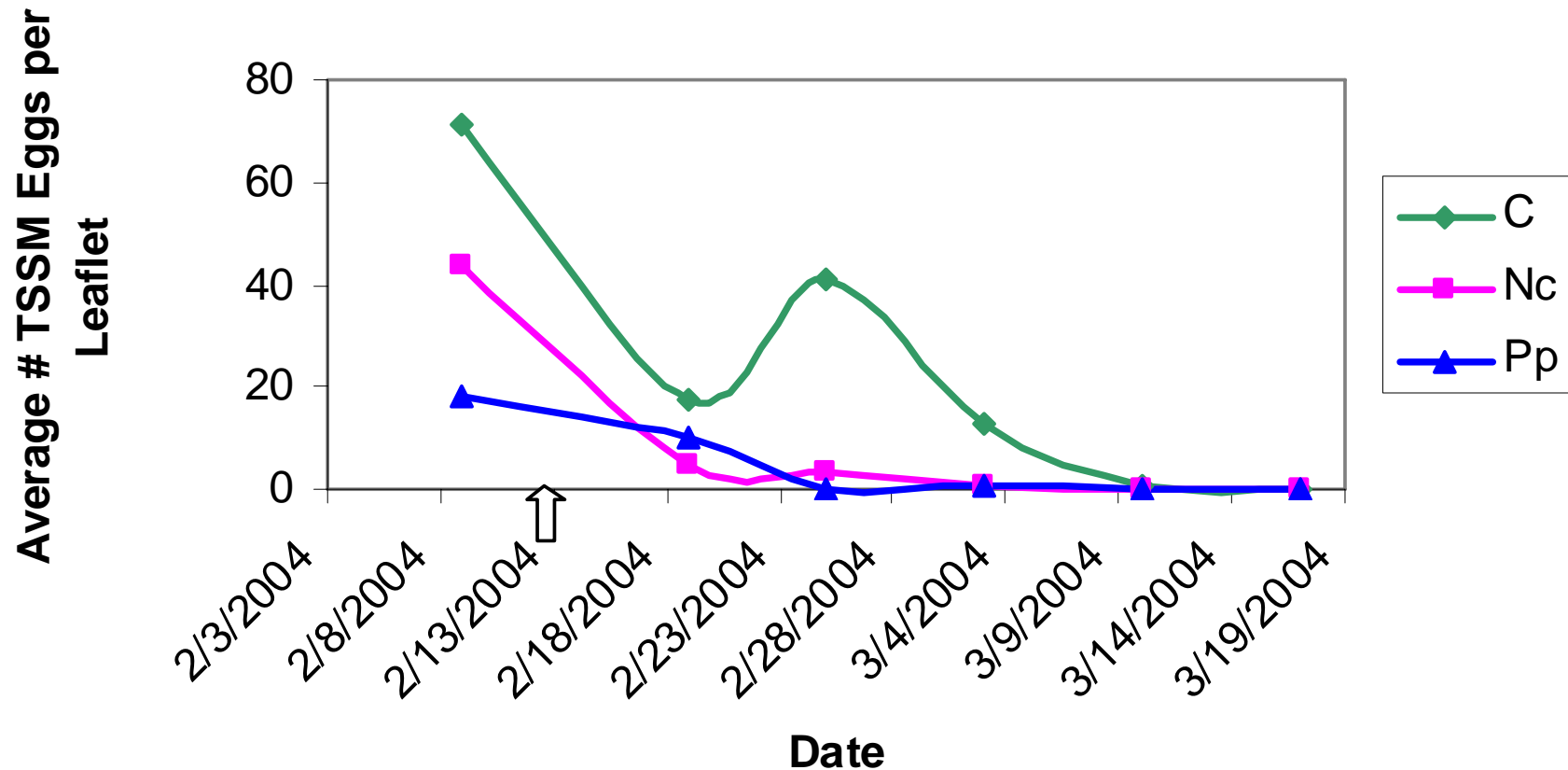
P = 0.2700





# Laboratory Results (Eggs)

Average TSSM Eggs per Treatment per Week



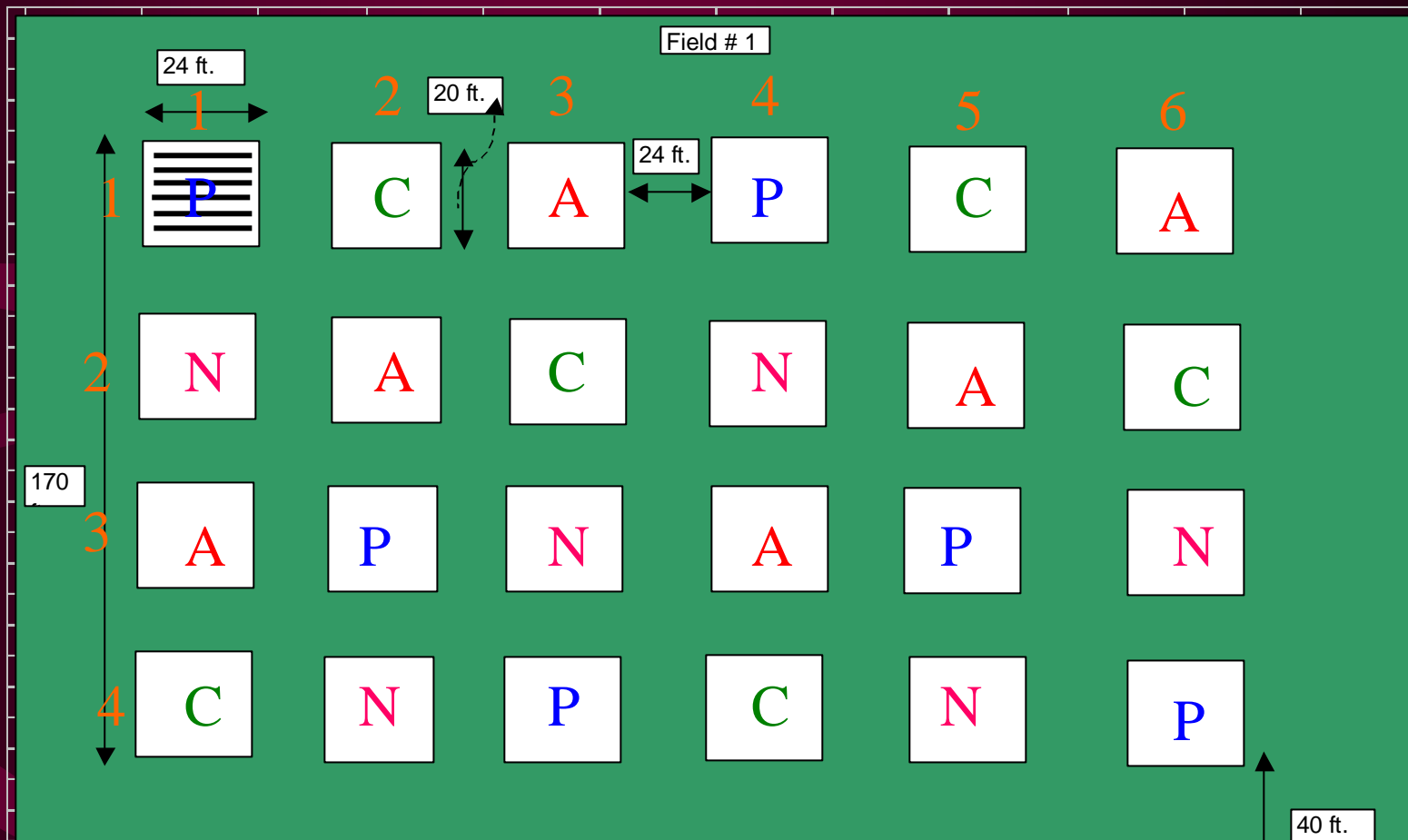


# Conclusions (Laboratory)

- In laboratory experiments, neither *P. persimilis* nor *N. californicus* suppressed populations of TSSM on strawberry to a significant extent.



# Methods (Field)



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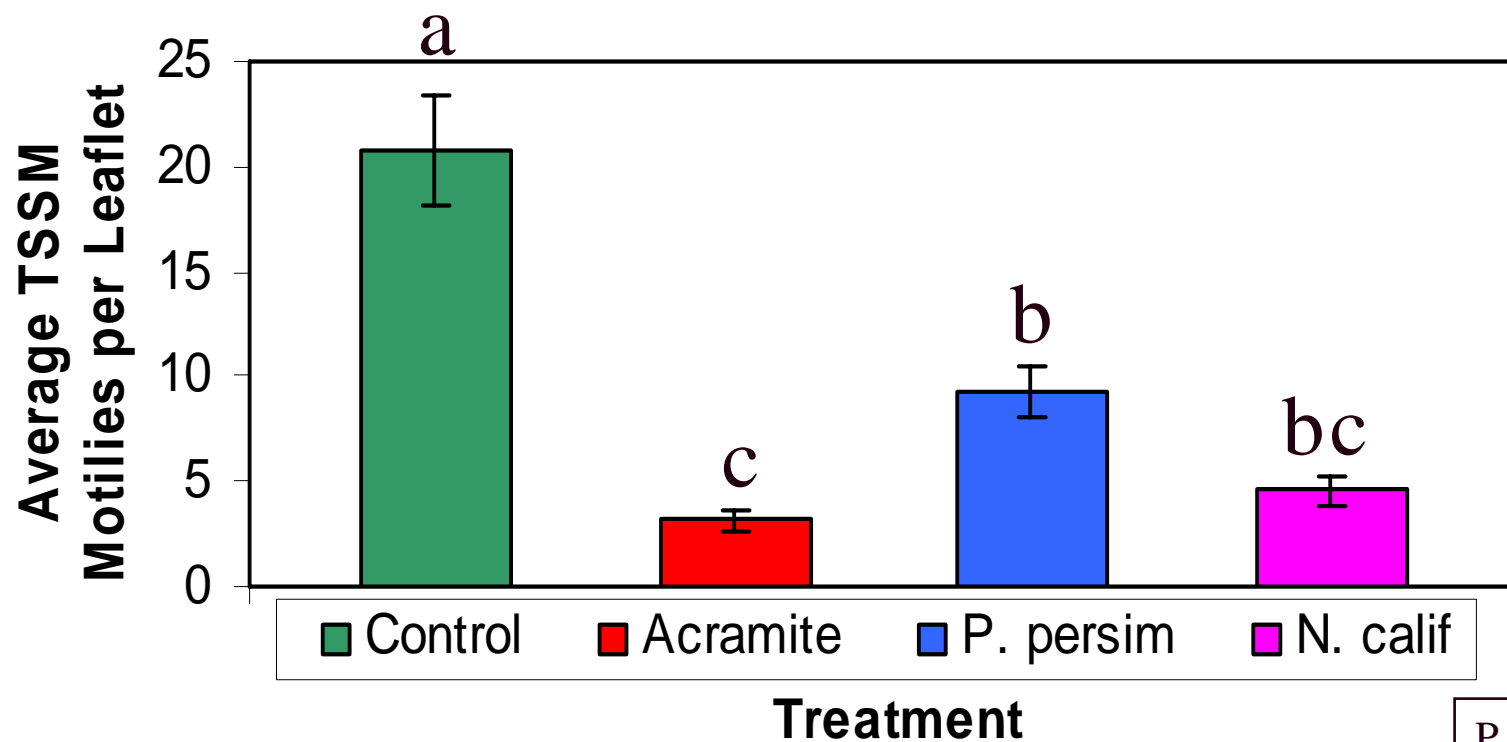
- Samples were taken once per week starting on 11/24/2003
  - 1 leaflet per row (6 leaflets per plot)
- Dates treatments were applied
  - 12/11/2003 & 2/11/2004: Predators released into N and P plots, at the rate of 1 predator for 10 TSSM.
  - 12/18/2003 & 2/14/2004: Acramite applied to A plots.





# Field Results (Motiles)

Average TSSM Motile Population for the Season



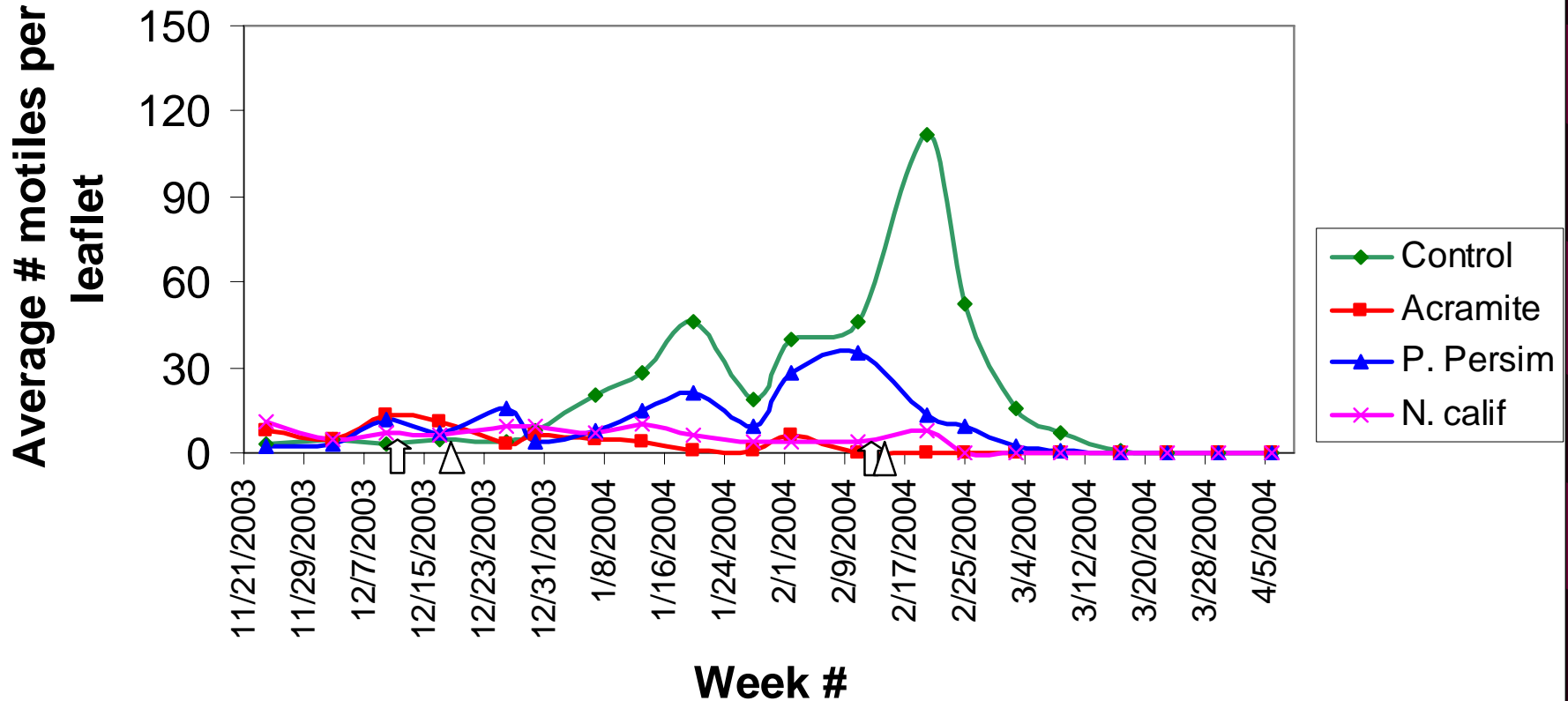
P < 0.0001





# Field Results (Motiles)

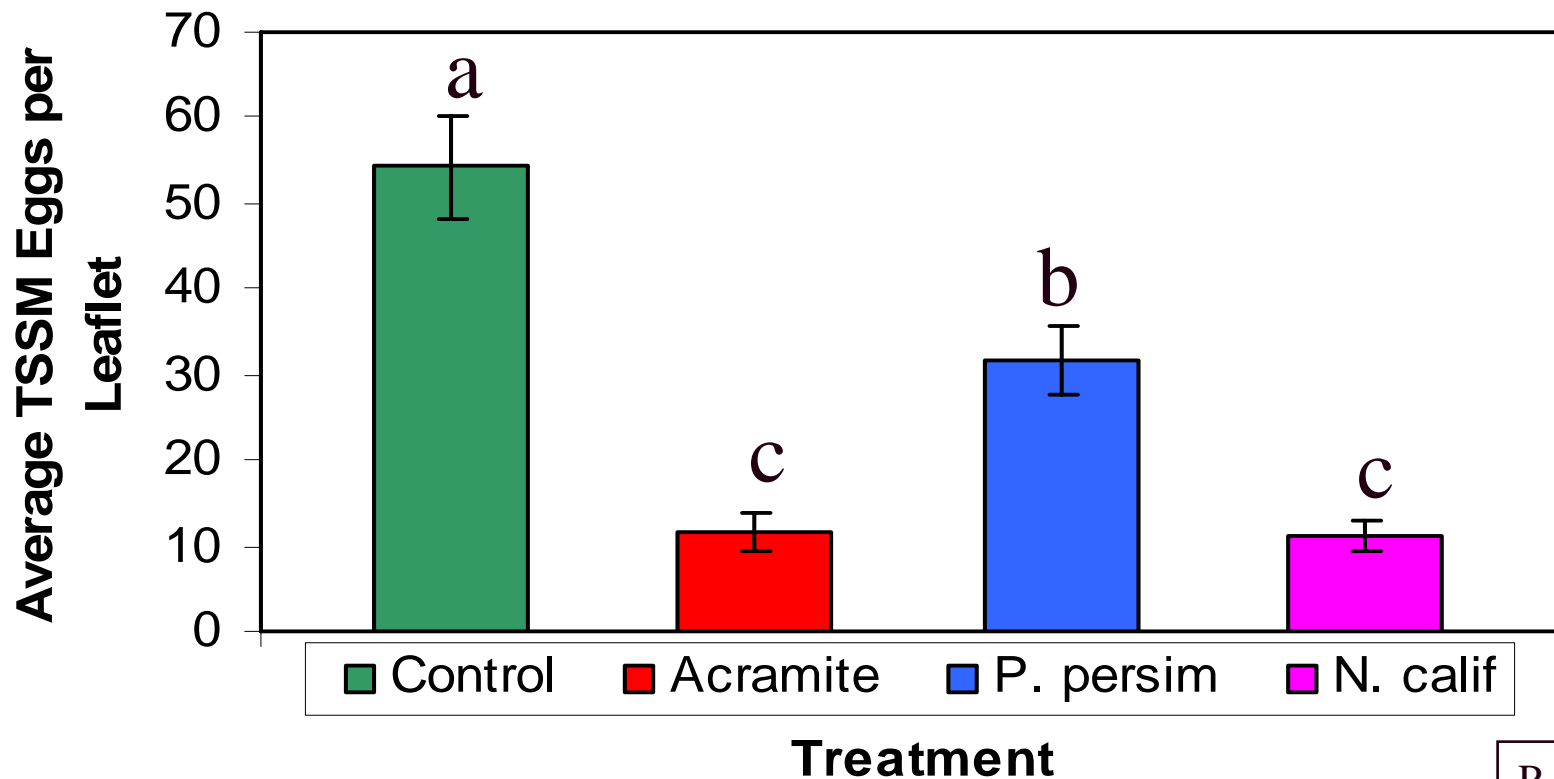
## Average TSSM Motiles per Treatment per Week





# Field Results (Eggs)

Average TSSM Egg Population for the Season

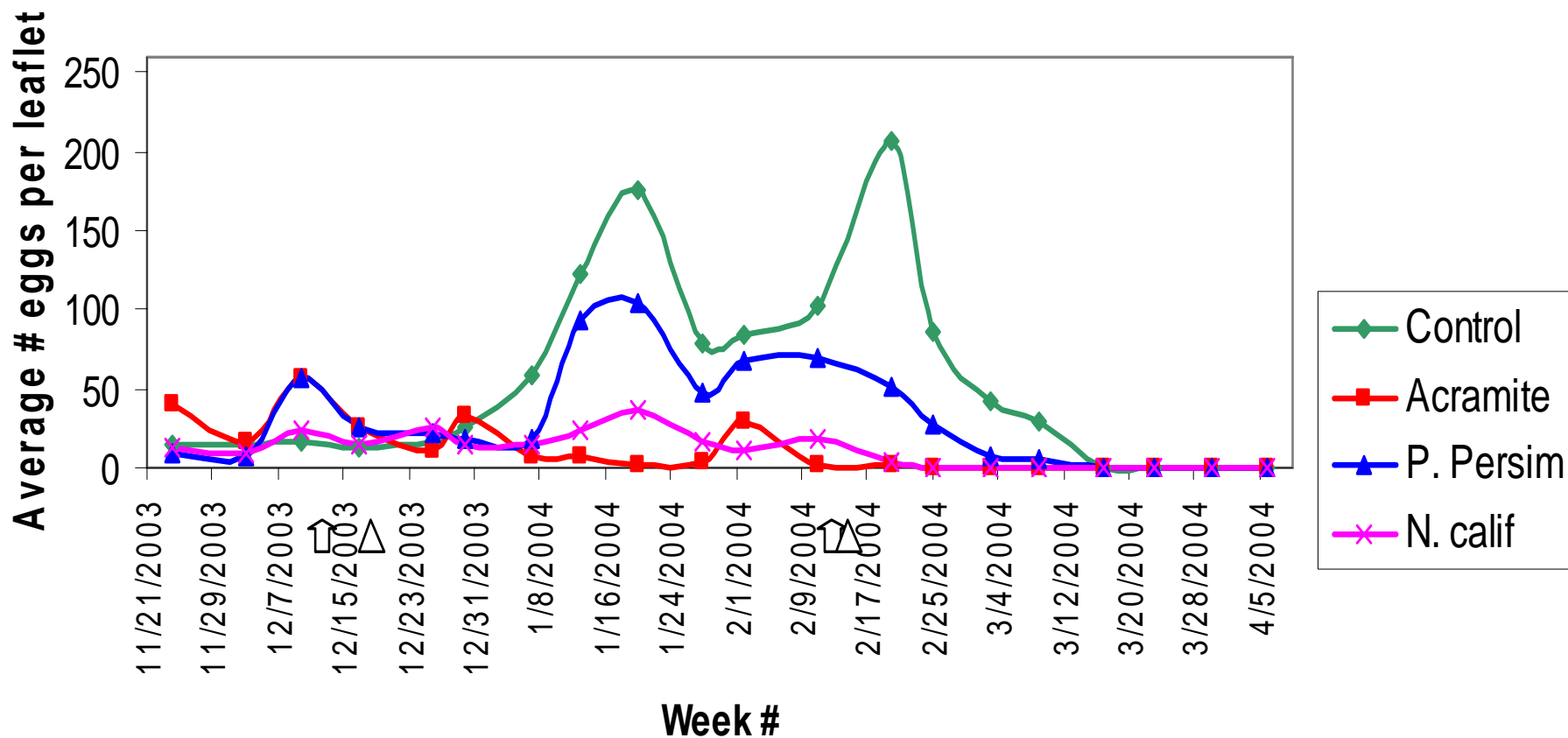


$P < 0.0001$



# Field Results (Eggs)

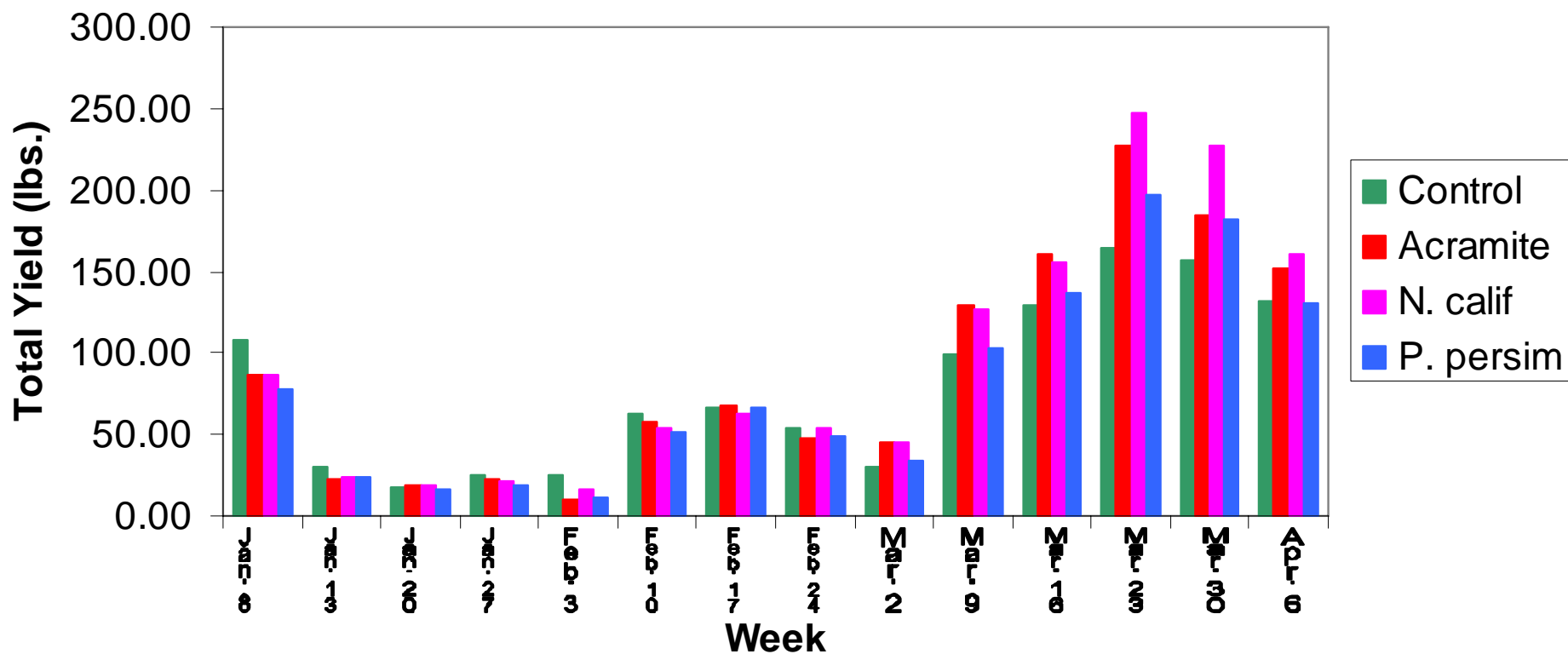
Average TSSM Eggs per Treatment per Week





# Field Results (Yield)

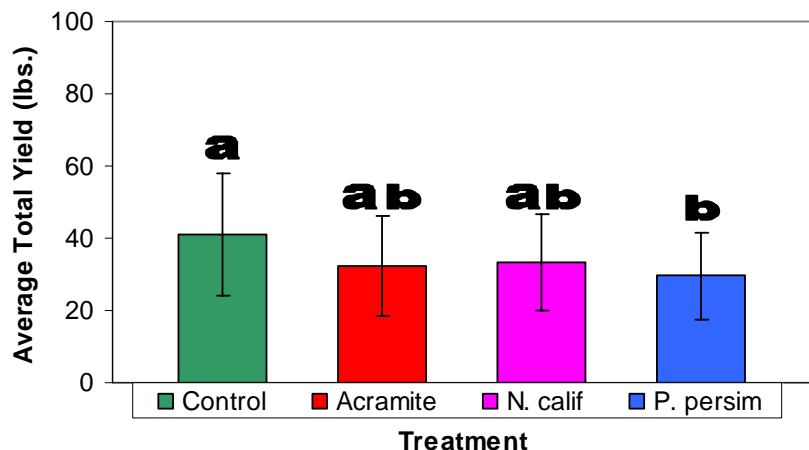
## Total Weekly Strawberry Yield





# Field Results (Yield)

Average Total Yield per Treatment for Early Season



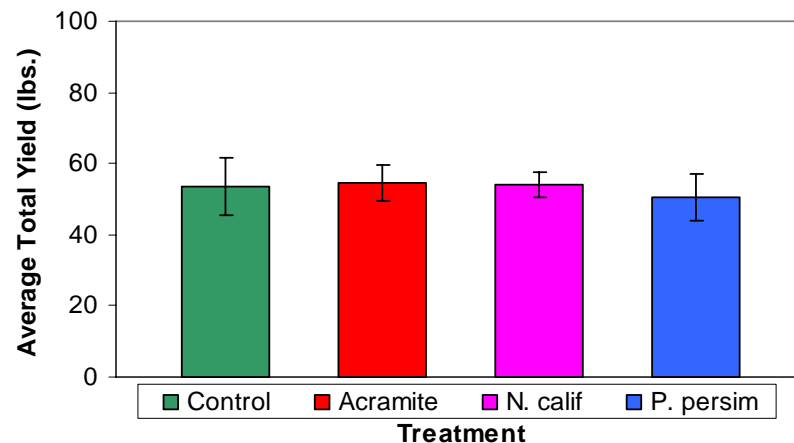
1/8/04 – 2/3/04

$P = 0.0205$

2/10/04 – 3/2/04

$P = 0.6809$

Average Total Yield per Treatment for Mid Season

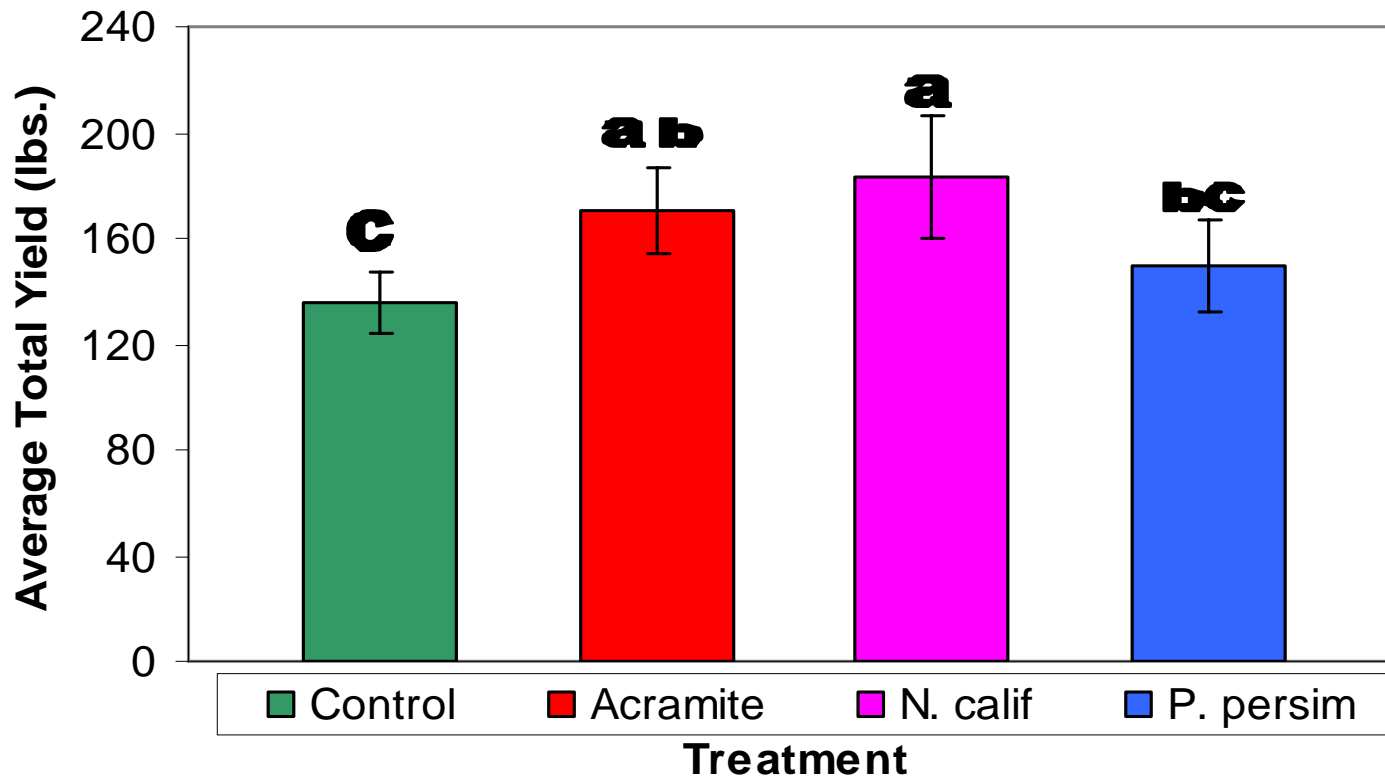




# Field Results (Yield)



Average Total Yield per Treatment for Late Season



3/9/04 – 4/6/04

$p = 0.0003$



## Conclusions (Field)

- Two applications of Acramite effectively controlled TSSM populations in the field
- *N. californicus* gave better control of TSSM populations in the field than did *P. persimilis*.
- Late season yield was highest from the *N. californicus* treated plots and lowest from the untreated control plots.



# Future Research

- To conduct more laboratory experiments evaluating the effects of *N. californicus* and *P. persimilis* on twospotted spider mites
- To study the effects of releasing *N. californicus* and *P. persimilis* as a single treatment on population of twospotted spider mites as well as effects on the individual predator species
- To repeat field experiments in the upcoming 2004/2005 strawberry field season



# Acknowledgements

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